Paddlefish (*Polyodon spathula*)

State Rank: S2
Global Rank: G4

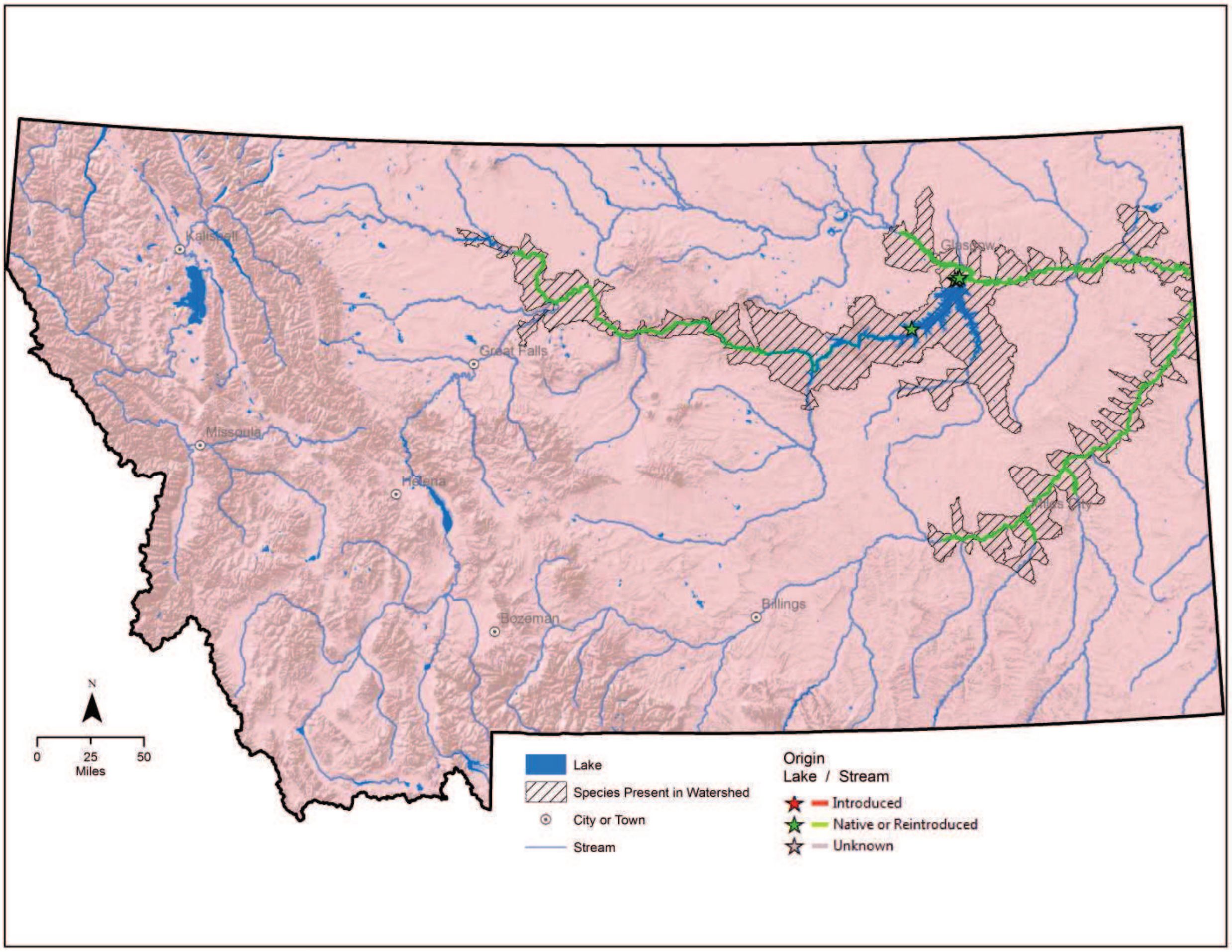

Figure 45. Distribution of paddlefish

Habitat

The paddlefish is a large river species that utilizes a wide variety of habitats seasonally and at different life stages. Optimal spawning habitat consists mainly of turbid, faster flowing main channel areas with gravel substrates, whereas feeding habitat is typically slower moving backwaters, side channels, and sloughs where their zooplanktonic food is more abundant. In the twentieth century, Montana's paddlefish have adapted successfully to feeding in Missouri River reservoir habitat, resulting in an increased population size over historical (pre-reservoir) levels (Scarnecchia et al. 1996). Young-of-the-year paddlefish utilize turbid headwater reaches of Fort Peck Reservoir (Kozfkay and Scarnecchia 2002) and Lake Sakakawea (Fredericks and Scarnecchia 1997) for particulate feeding. Larger juveniles and adults large enough to more effectively avoid predation (Parken and Scarnecchia 2002) filter feed throughout the reservoirs.

Management

Paddlefish stocks in Montana are adequate to support a recreational fishery. Current research and monitoring are designed to prevent over-harvest and insure a sustainable wild fishery. Paddlefish are managed as 2 naturally-reproducing stocks: the Yellowstone River and Missouri below Fort

Peck Dam, and the Missouri River above Fort Peck Dam. The Yellowstone stock is managed cooperatively through a joint management plan with the State of North Dakota. Harvest of this recreational fishery is accomplished by snagging, and targets for each stock are set on an annual basis. Since 2010 the target has been 1,000 fish for the Yellowstone/lower Missouri and 500 fish for the Missouri upstream of Fort Peck Reservoir. The harvest is closely monitored by biologists and creel clerks and can be closed immediately or with 24 hours notice, depending on the location. One unique aspect of the Yellowstone fishery is the presence of a caviar operation, which is run by the Glendive Chamber of Commerce. Proceeds from this operation are divided between the City of Glendive and FWP, with the State's share going to help fund research and management activities for the species.

The population and demographics of each stock is re-calculated annually for the purpose of evaluating the sustainability of the harvest. Details of the management goals and activities can be found in the Interstate Management plan "Management Plan for Montana and North Dakota Paddlefish Stocks and Fisheries" (North Dakota Game and Fish Department and Montana Fish, Wildlife & Parks 2008).

Management Plans

Montana Fish, Wildlife & Parks. 2013. Montana Statewide Fisheries Management Plan, 2013-2018. Montana Fish, Wildlife & Parks, Helena, Montana. 478 pp.

North Dakota Game and Fish Department and Montana Department of Fish, Wildlife & Parks. 2008. Management Plan for North Dakota and Montana Paddlefish Stocks and Fisheries. Bismarck, North Dakota and Helena, Montana.

Paddlefish Current Impacts, Future Threats, and Conservation Actions

Current Impacts	Future Threats	Conservation Actions
Illegal harvest Overfishing	Illegal harvest Overfishing	Enforce existing harvest regulations
Loss of spawning habitat	Loss of spawning habitat	Maintain instream flows and spawning habitat in large rivers (especially the Yellowstone River and Missouri River above Fort Peck Reservoir)
Water depletions	Water depletions	Increased reservoir water retention during times of drought

Current Impacts	Future Threats	Conservation Actions
	Climate change	Continue to evaluate current climate science models and recommended actions Maintain connectivity Monitor habitat changes and address climate impacts through adaptive management as necessary Routine monitoring of known populations
	Potential introduction of exotic competitors (e.g., bighead carp *Aristichthys nobilis*)	Improve public awareness of paddlefish conservation concerns and impacts of non-native species

Additional Citations

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Scarnecchia, D. L., P. A. Stewart, and G. Power. 1996. Age structure of the Yellowstone-Sakakawea paddlefish stock, 1963–1993, in relation to reservoir history. Transactions of the American Fisheries Society 125:291–299.

Pallid Sturgeon (*Scaphirhynchus albus*)

State Rank: S1
Global Rank: G2

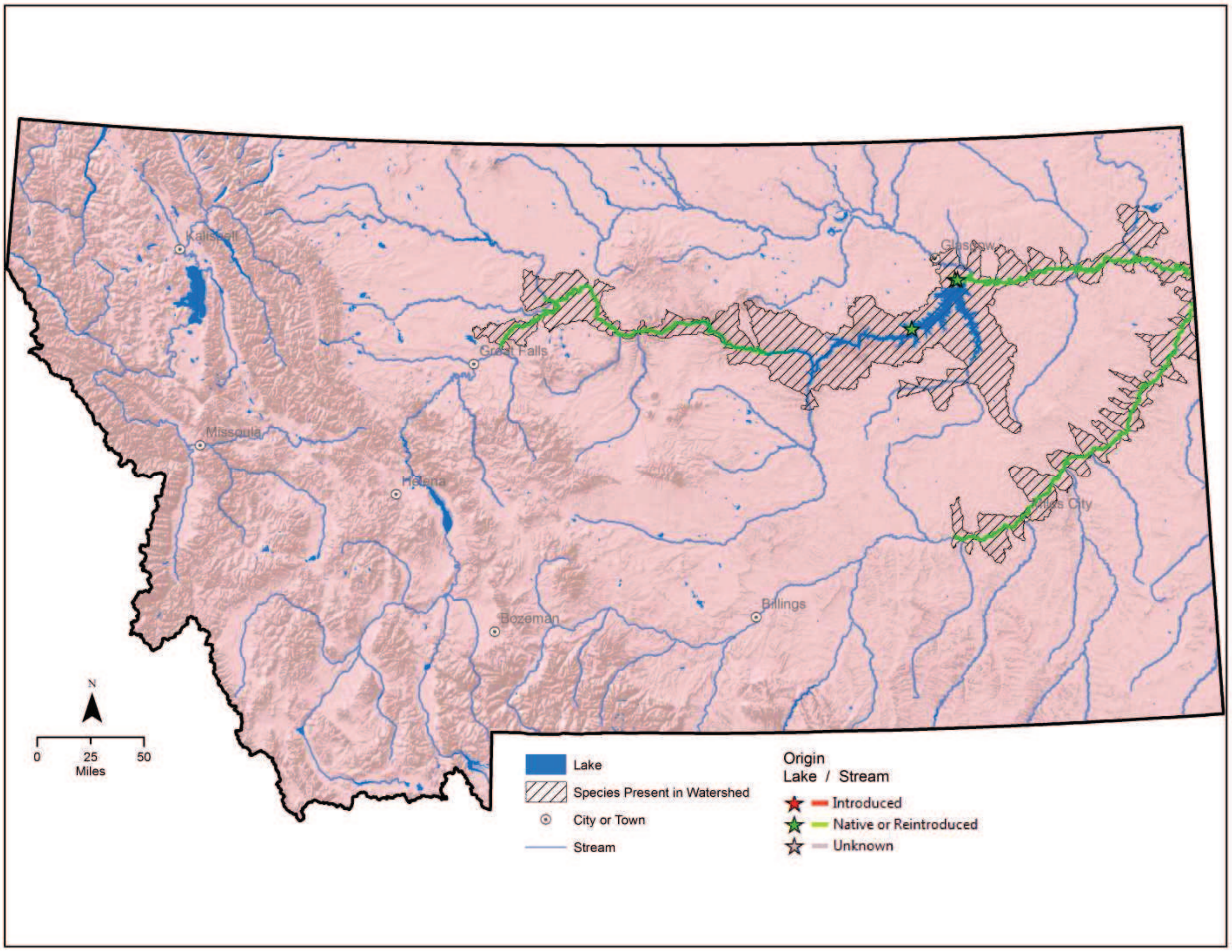

Figure 46. Distribution of the pallid sturgeon

Habitat

Pallid sturgeon use large, turbid rivers over sand and gravel bottoms, usually in strong current. In Montana, pallid sturgeon use large turbid streams including the Missouri and Yellowstone Rivers (Brown 1971; Flath 1981). They also use all channel types, primarily straight reaches with islands (Bramblett 1996). They primarily use areas with substrates containing sand (especially bottom sand dune formations) and fines (93% of observations; Bramblett 1996). Stream bottom velocities range between 0.0 and 4.49 feet per second, with an average of 2.13 feet per second (Bramblett 1996). Depths used are 2.0 to 47.57 feet, averaging 10.83 feet, and they appear to move deeper during the day (Bramblett 1996). Channel widths from 360 to 3600 feet are used and average 1,063 feet (Bramblett 1996). Water temperatures used range from 37 to 68 degrees F. (Tews 1994; Bramblett 1996). Water turbidity ranges from 12 to 6,400 NTU (Turbidity Units) (Tews 1994).

Pallid sturgeon are long-lived (50+ years), highly migratory, and require large, turbid, relatively warm, and free-flowing rivers to successfully reproduce. The construction of dams and corresponding impoundments on the upper Missouri River beginning in the early 1900's, (e.g., Canyon Ferry and Fort Peck reservoirs, and North Dakota's Lake Sakakawea), Yellowstone River (e.g., Intake Diversion Dam), and associated dammed tributaries (e.g., Yellowtail, Tongue and Tiber reservoirs on the Bighorn, Tongue and Marias rivers) have impeded successful spawning and recruitment of pallid sturgeon in Montana. Dams and impoundments block migration routes, alter natural spawning cues such as discharge, temperature and turbidity, fragment populations (i.e., above Fort Peck Reservoir), and alter habitats necessary for survival of fry.

Management

Management plans and conservation efforts for pallid sturgeon are developed and implemented through a USFWS-coordinated Recovery Team that includes state- and federally-appointed staff. Short-term management objectives for the species include preventing local extirpation through population supplementation with hatchery-propagated fish, providing adult upstream passage at Intake Diversion Dam on the Yellowstone River, and developing strategies to address impacts to spawning and recruitment related to Fort Peck and Sakakawea reservoirs. Long-term and natural persistence of pallid sturgeon will require changes to reservoir operations that result in reestablishment of spawning cues and habitats necessary for fry survival. Though released hatchery reared juvenile pallid sturgeon number in the thousands, it is currently estimated that fewer than 120 adult pallid sturgeon persist in the upper Missouri and Yellowstone rivers above Lake Sakakawea.

Beginning in 1996, research efforts focused on pallid sturgeon recovery and preserving the pallid sturgeon genetic pool through collection of wild gametes and subsequent stocking of hatchery reared juvenile sturgeon. The primary purpose of the stocking program is to preserve the genetic pool and reconstruct an optimal population size within the habitat's carrying capacity (Krentz 1997; American Fisheries Society (AFS) website 2013). In 2000 USFWS completed an ESA consultation with USACOE regarding operation of Missouri River dams. Through an informal agreement the BOR agreed to provide a dominant discharge spring pulse out of the Tiber Reservoir every 4 to 5 years for Missouri River fish migrations that could help the Upper Missouri River pallid sturgeon population. To address pallid sturgeon passage and entrainment on the Yellowstone River, the USFWS has begun consultation with BOR regarding problems at the Intake Diversion Dam. The future for pallid sturgeon recovery may continue to be uncertain even after positive changes have been implemented because pallid sturgeon populations are so depleted and the newly stocked fish will take at least 15 years before the females first reach sexual maturity and begin to spawn. Therefore, it is important to realize that immediate evaluations are impractical, and recovery will take a dedicated, long-term commitment (AFS website 2013). Implementing the pallid sturgeon recovery program in this area is a multistate and multiagency task. To facilitate this, the Montana/Dakota Pallid Sturgeon Work Group was organized in 1993. The group is composed of representatives from FWP, South Dakota Game, Fish and Parks Department, USFWS, USACOE, BOR, Western Area Power Administration, and PPL-Montana, and acts in an advisory role identifying research needs and funding sources, developing work plans, and providing an opportunity for communication between biologists and agency personnel (AFS website 2013).

Management Plans
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Montana Fish, Wildlife & Parks. 2013. Montana Statewide Fisheries Management Plan, 2013-2018. Montana Fish, Wildlife & Parks, Helena, Montana. 478 pp.

Upper Basin Workgroup. 2008. Memorandum of Understanding for Upper Basin Pallid Sturgeon Recovery Implementation.

Pallid Sturgeon Current Impacts, Future Threats, and Conservation Actions

Current Impacts	Future Threats	Conservation Actions
Habitat modifications such as dams prevent movement to spawning and feeding areas, alter flow regimes, turbidity, and temperature, and reduce food supply	Habitat modifications such as dams prevent movement to spawning and feeding areas, alter flow regimes, turbidity, and temperature, and reduce food supply	Protect minimum instream flow reservations to ensure that the pallid sturgeon population will not be impacted Restore more natural flow and temperature conditions in the rivers below mainstream and tributary dams
Heavy metals and organic compounds may affect reproduction	Heavy metals and organic compounds may affect reproduction	Work with watershed groups, agencies, organizations, and the public to identify and reduce point source pollutants
Hybridization with shovelnose sturgeon, possibly caused by reductions in habitat diversity	Hybridization with shovelnose sturgeon, possibly caused by reductions in habitat diversity	Support research to better understand hybridization issues as they relate to habitat
Low population numbers	Low population numbers	Establish multi-aged pallid sturgeon populations in the Middle Missouri, Lower Missouri, and Yellowstone rivers to prevent extinction Improve knowledge of pallid sturgeon life cycle requirements and continue to research limiting factors affecting its existence

Current Impacts	**Future Threats**	**Conservation Actions**
Upstream and nearby land use practices may degrade water quality	Upstream and nearby land use practices may degrade water quality	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas Work with landowners and land management agencies to limit activities that may be detrimental to this species
	Climate change	Continue to evaluate current climate science models and recommended actions Maintain connectivity Monitor habitat changes and address climate impacts through adaptive management as necessary Routine monitoring of known populations

Additional Citations

American Fisheries Society, Montana Chapter website. 2013. http://www.fisheriessociety.org/AFSmontana/PallidSturgeon.html

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Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books. Montana State University, Bozeman, Montana.

Flath, D. L. 1981. Vertebrate species of special concern. Montana Department of Fish, Wildlife & Parks. 74 pp.

Krentz, Steven. 1997. Stocking/augmentation plan for the pallid sturgeon (*Scaphirhynchus albus)* in Recovery Priority Management Areas 1 and 2 in Montana and North Dakota. U.S. Fish and Wildlife Service. Bismarck, North Dakota. 38 pp.

Tews, A. 1994. Pallid sturgeon and shovelnose sturgeon in the Missouri River from Fort Peck Dam to Lake Sacagawea and in the Yellowstone River from Intake to its mouth. Fort Peck Pallid Sturgeon Study. Submitted to U.S. Army Corps of Engineers, Planning Branch, Omaha, Nebraska.

Pearl Dace (*Margariscus margarita*)

State Rank: S2
Global Rank: G5

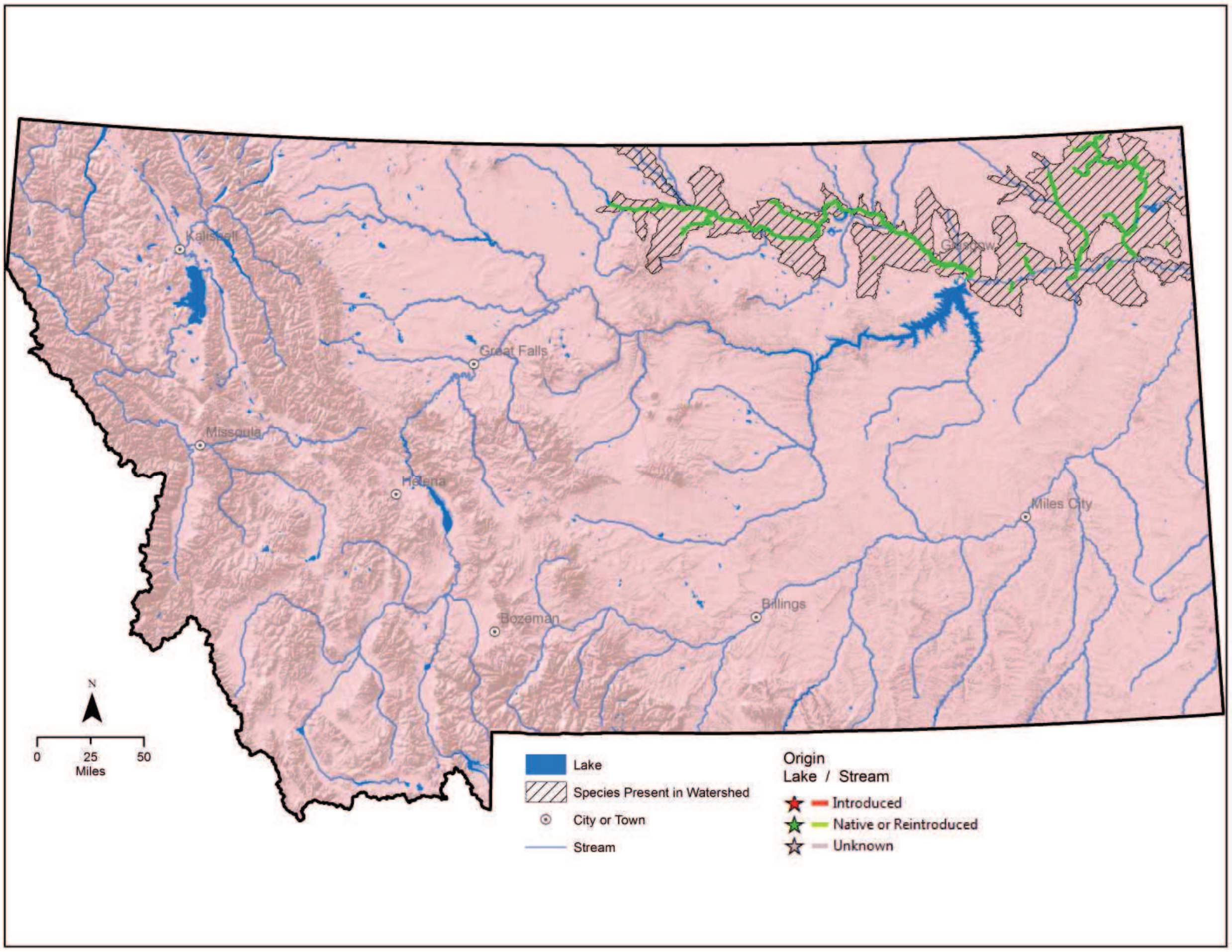

Figure 47. Distribution of the pearl dace

Habitat

Pearl dace occur in lakes, cool bog ponds, creeks, and cool springs (Scott and Crossman 1973). Little habitat-related information exists for this species in Montana. At 4 stream locations where pearl dace were captured in northeastern Montana, average stream widths ranged from 17.7 to 38.7 feet, average thalweg depths ranged from 1.3 to 4.6 feet, substrates ranged from 53 to 100% fine substrate (less than 0.06 mm), and aquatic macrophytes were sparse to very heavy (less than 10 to more than 75% coverage; Bramblett, unpublished data). Eleven fish species were associated with pearl dace in 7 collections from 4 sites on 4 Montana streams.

Pearl dace appear to prefer cool to cold water temperatures. In Canada, pearl dace were more often found to co-occur with brook trout (*Salvelinus fontinalis*) and mottled sculpin (*Cottus bairdi*) at water temperatures of 60.4 to 61.9 degrees F than with smallmouth bass (*Micropterus dolomieu*) and rock bass (*Ambloplites rupestris*) at 69.4 to 70.7 degrees F (Becker 1983). The upper lethal temperature for pearl dace was found to be 88.0 degrees F (Becker 1983). In the southernmost part of their range in Maryland and Virginia, pearl dace were found in streams that were cool in summer and warm in winter, with substantial spring-water input (Tsai and Fava

1982). In Montana, pearl dace were captured in streams with daytime water temperatures from July through September ranging from 49.3 to 73.6 degrees F (Bramblett, unpublished data).

Management Plan
Montana Fish, Wildlife & Parks. 2013. Montana Statewide Fisheries Management Plan, 2013-2018. Montana Fish, Wildlife & Parks, Helena, Montana. 478 pp.

Pearl Dace Current Impacts, Future Threats, and Conservation Actions

Current Impacts	Future Threats	Conservation Actions
Anthropogenic stressors that increase water temperatures	Anthropogenic stressors that increase water temperatures	Work with landowners and land management agencies to limit activities that may be detrimental to this species
Collected by anglers seeking bait minnows	Collected by anglers seeking bait minnows	Educate anglers on species identification and importance of native fish
Limited distribution in Montana renders it vulnerable to extirpation from the state	Limited distribution in Montana renders it vulnerable to extirpation from the state	Consider preparing a management plan for the pearl dace or include it into other comprehensive taxonomic plans Fish surveys supported by voucher specimens should be conducted in streams across the range (including areas of historical records) of the species to better determine its geographic range
Populations vulnerable to predation and competition	Populations vulnerable to predation and competition	Reduce stocking of non-native fish (especially pike) that may compete with or prey on this species
	Climate change	Continue to evaluate current climate science models and recommended actions Maintain connectivity Monitor habitat changes and address climate impacts through adaptive management as necessary Routine monitoring of known populations

Additional Citations

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Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Bulletin 184, Fisheries Research Board of Canada, Ottawa.

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Sauger (*Sander canadensis*)

State Rank: S2
Global Rank: G5

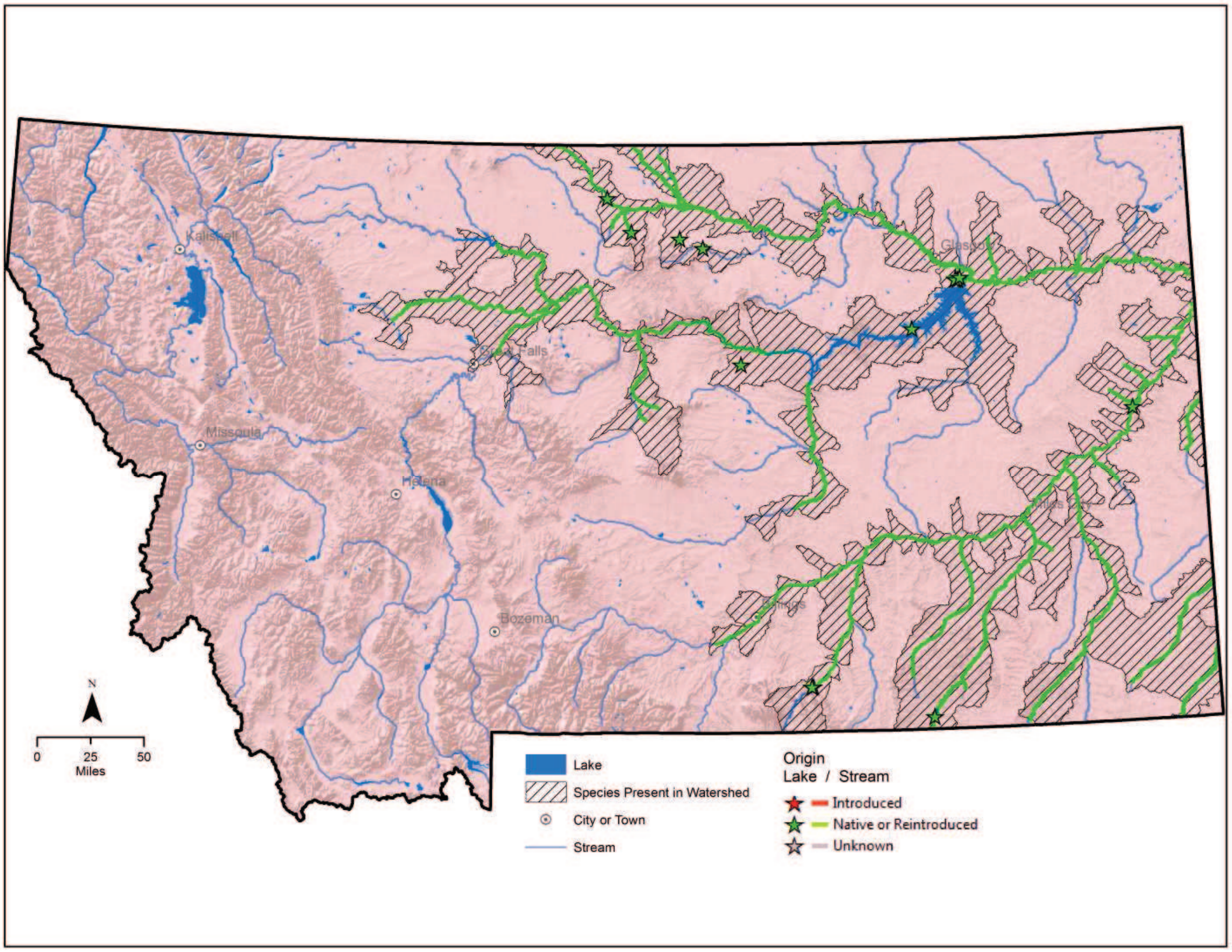

Figure 48. Distribution of sauger

Habitat

Sauger typically occur in large turbid rivers and shallow turbid lakes (Becker 1983). Turbidity is an important delineator of suitable habitat for sauger. Physiological adaptations, such as a highly advanced light-gathering retina, allow sauger to thrive in low-light environments (Ali and Anctil 1977; Crance 1987). At cool water mesotherms, sauger have a fairly wide range of thermal tolerance with occupied temperatures ranging from 33.8 to 86.0 degrees F and a physiological optimum of 64.4 to 75.2 degrees F (Crance 1987; Carlander 1997).

Sauger are heavily dependent throughout their life histories on unimpeded access to the wide diversity of physical habitats that are present in large river systems. They are considered to be the most migratory percid (Collette 1977). Their migratory behavior, which is primarily related to spawning, is well documented throughout their range with annual movements of up to 373 miles between spawning and rearing habitats (Nelson 1968; Collette et al. 1977; Penkal 1992; Pegg et al. 1997; Jaeger 2004). Sauger are highly selective for spawning sites and commonly travel long distances to aggregate in a relatively few discrete areas to spawn (Nelson 1968; Nelson 1969; Gardner and Stewart 1987; Penkal 1992). Although primary stem spawning does occur (Jaeger

2004), it has been suggested that sauger populations are strongly reliant on access to large tributaries for spawning (Nelson 1968; Gardner and Stewart 1987; Penkal 1992; Hesse 1994; McMahon 1999). Spawning locations are associated with unique geomorphic features, such as bluff pools and bedrock reefs, and rocky substrates over which sauger broadcast their eggs (Nelson 1968; Gardner and Stewart 1987; Hesse 1994; Jaeger 2004). During a 10- to 12-day period following emergence, it is thought that larval sauger drift long distances downstream - up to 186 miles - prior to gaining the ability to maneuver horizontally and begin feeding (Nelson 1968; Penkal 1992; McMahon 1999). Juveniles rear in side channels, backwaters, oxbows, and other off-channel habitats during spring and summer before shifting to primary channel habitats in autumn (Gardner and Berg 1980; Gardner and Stewart 1987; Hesse 1994). Adult sauger also use off-channel and channel-margin habitats during the spring and early summer periods of high flow and turbidity, and then move to deeper primary channel habitats in late summer and autumn as decreasing flows and turbidities cause suitable off-channel habitats to become unavailable (Hesse 1994; Jaeger 2004).

Management

Sauger have become rare or absent in a number of larger rivers in Montana (e.g., Judith, Poplar, Big Horn and Tongue rivers), due in part to dams, diversions and impoundments that have altered temperature, flow regime and favored river habitats, and obstruct migrations. Additional management concerns include entrainment in irrigation canals, streambank alterations, and competition or hybridization with non-native species (e.g., smallmouth bass and walleye). Though it remains widely distributed in the Missouri and Yellowstone rivers, and is common in some locations, the sauger is listed as a Montana SOC owing to an estimated 50% reduction in distribution and widespread threats.

The sauger has received considerable management attention since reductions in abundance were first noted in the drought years in the 1980's. Several studies have since been completed to better understand the species overall status, habitat needs, movement patterns and threats. These assessments have provided important information on the impact of habitat alteration on sauger and other prairie river species (e.g., blue sucker, sturgeon, paddlefish), and recent restoration efforts have been directed towards reducing entrainment in irrigation canals, and promoting movement in the Tongue River through construction of a by-pass channel around an irrigation dam. Modifying dam operations to promote more natural hydrographs and temperatures on mainstem and tributary rivers will continue to be important but difficult issue to address. Hybridization between sauger and non-native walleye is also a concern, and the issue is being preemptively addressed in the Bighorn River system through stocking of sterile walleye in Yellowtail Reservoir.

On larger rivers, spring and fall aggregations of sauger provide for popular fisheries, though overall, less than 0.2% of statewide angling pressure is targeted towards the species. Standard angling limits for sauger are 5 daily and 10 in possession, though to protect some populations from the potential stress of over-harvest, in many locations limits are reduced to one daily and 2 in possession.

Management Plan
Montana Fish, Wildlife & Parks. 2013. Montana Statewide Fisheries Management Plan, 2013-2018. Montana Fish, Wildlife & Parks, Helena, Montana. 478 pp.

Sauger Current Impacts, Future Threats, and Conservation Actions

Current Impacts	Future Threats	Conservation Actions
Barriers that negatively influence spawning movement patterns and larval drift	Barriers that negatively influence spawning movement patterns and larval drift	Improve passage at several irrigation-related migratory barriers Removal of primary stem and tributary impoundments
Channelization and loss of side channel habitat for larval and juvenile sauger	Channelization and loss of side channel habitat for larval and juvenile sauger	Install fish screens and return structures to minimize entrapment of fish in irrigation canals
Hybridization with walleye	Hybridization with walleye	Continue surveying and monitoring of species Stock triploid walleye
Negative interactions with other species such as walleye and smallmouth bass	Negative interactions with other species such as walleye and smallmouth bass	Research to better understand interaction between sauger and non-native species Supplemental stocking of native sauger to replace decreased walleye stocks
Overexploitation	Overexploitation	Continue to manage harvest as needed
Reservoir operation that alters the natural hydrograph	Reservoir operation that alters the natural hydrograph	Flow releases from dams can be regulated throughout the year to maximize spawning success and year-class strength of sauger (Nelson 1968; Walburg 1972) Preserve natural hydrographs, natural processes of channel formation, and high degrees of connectivity where sauger currently exist Restock sauger in oxbows for dispersal into river

Current Impacts	Future Threats	Conservation Actions
Water withdrawals resulting in low river flows	Water withdrawals resulting in low river flows	Minimize the diversion of water from river channels and limit processes such as channelization and streambank armoring that result in loss of important off-channel habitats Work with landowners and other agencies to limit activities that may be detrimental to this species
	Climate change	Continue to evaluate current climate science models and recommended actions Maintain connectivity Monitor habitat changes and address climate impacts through adaptive management as necessary Routine monitoring of known populations

<u>Additional Citations</u>

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Shortnose Gar (*Lepisosteus platostomus*)

State Rank: S1
Global Rank: G5

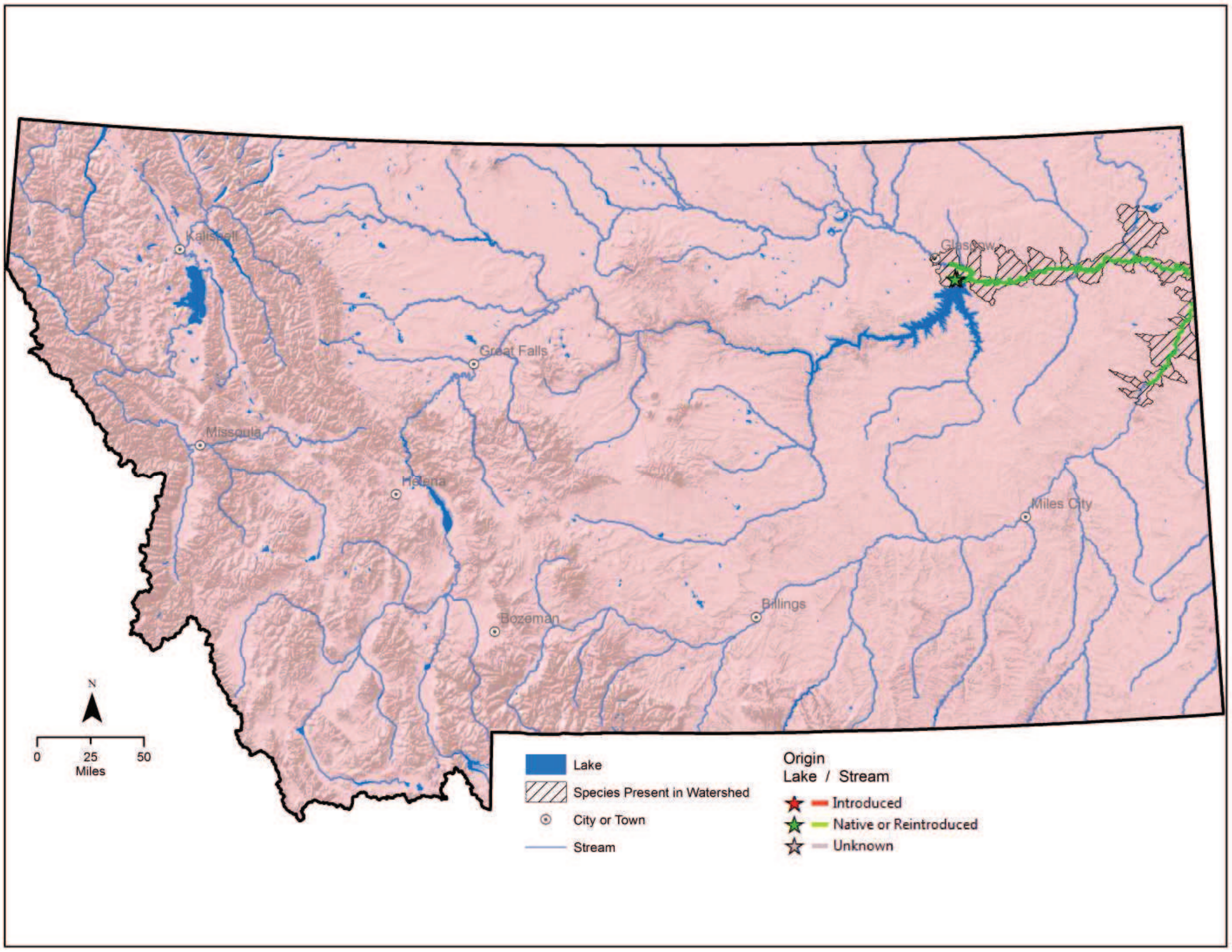

Figure 49. Distribution of shortnose gar

Habitat

Due to its limited distribution little is known about the shortnose gar within Montana. The shortnose gar is typically found in large rivers, quiet pools, backwaters, and oxbow lakes. It has a higher tolerance to turbid water than the other 4 gar species found in North America (AFS website 2013). Gar also have the unique ability to supply a highly vascularized swim bladder with supplemental oxygen by engaging in a behavior of "breaking," where air is gulped at the surface (Pflieger 1975). This allows gar to occupy waters with extremely low dissolved oxygen concentrations, which would not be suitable for most other fish inhabitation.

Management Plan

Montana Fish, Wildlife & Parks. 2013. Montana Statewide Fisheries Management Plan, 2013-2018. Montana Fish, Wildlife & Parks, Helena, Montana. 478 pp.

Shortnose Gar Current Impacts, Future Threats, and Conservation Actions

Current Impacts	Future Threats	Conservation Actions
Backwater habitat filled in for agriculture and modified by lack of channel maintenance flows	Backwater habitat filled in for agriculture and modified by lack of channel maintenance flows	Increase conservation initiatives for backwater sloughs and channels
Cold water release, lack of turbidity, and artificial hydrograph below Fort Peck Dam may inhibit abundance in the lower Missouri River	Cold water release, lack of turbidity, and artificial hydrograph below Fort Peck Dam may inhibit abundance in the lower Missouri River	Manage water regimes to better represent natural water regimes
Limited information in Montana	Limited information in Montana	Consider preparing a management plan for the shortnose gar or include it into other comprehensive taxonomic plans Increase survey and monitoring efforts

Additional Citations

American Fisheries Society Montana Chapter website: 2013. http://www.fisheriessociety.org/AFSmontana/ShortnoseGar.html

Pflieger, W. L. 1975. The fishes of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

<u>Sicklefin Chub</u> (*Hybopsis meeki*)

State Rank: S1
Global Rank: G3

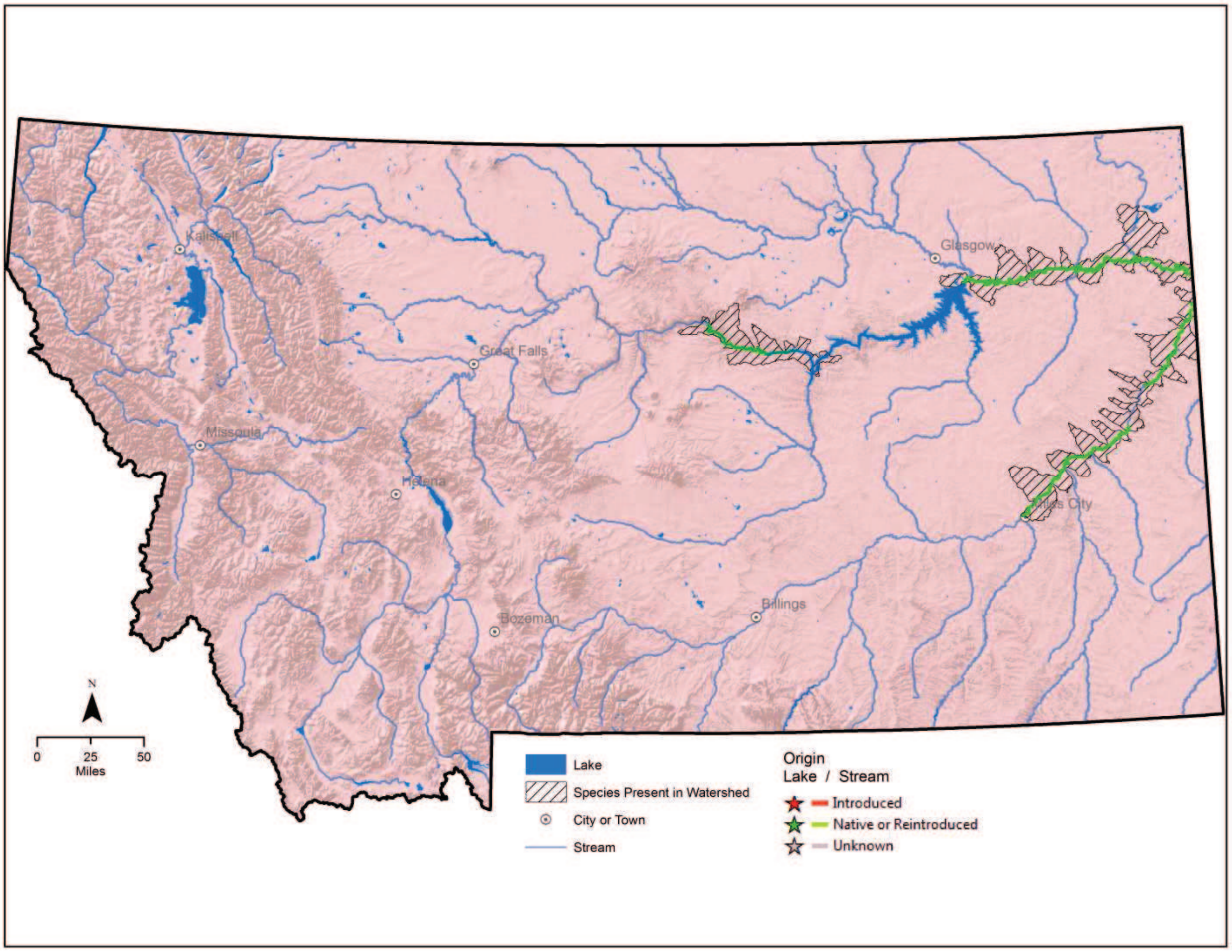

Figure 50. Distribution of sicklefin chub

<u>Habitat</u>
Sicklefin chub are strictly confined to the main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel (Pflieger 1975).

Unlike the sturgeon chub, all of the Montana captures have been from only the Missouri and Yellowstone rivers, indicating a strong preference for large turbid rivers (AFS website 2013).

<u>Management Plan</u>
Montana Fish, Wildlife & Parks. 2013. Montana Statewide Fisheries Management Plan, 2013-2018. Montana Fish, Wildlife & Parks, Helena, Montana. 478 pp.

Sicklefin Chub Current Impacts, Future Threats, and Conservation Actions

Current Impacts	Future Threats	Conservation Actions
Channelization of the Missouri River due to irrigation operations and development	Channelization of the Missouri River due to irrigation operations and development	Work with landowners and other agencies to limit activities that may be detrimental to this species
Decreased range and abundance of prey aquatic insect larvae due to dam construction and snag removal	Decreased range and abundance of prey aquatic insect larvae due to dam construction and snag removal	Increased monitoring and survey efforts in eastern Montana to monitor population trends and range expansion or loss and collect additional information on life history and ecology
Habitat alteration by dam operations, reducing turbidities and/or altering temperature and flow regimes	Habitat alteration by dam operations, reducing turbidities and/or altering temperature and flow regimes	Restore more natural flow and temperature conditions in the rivers below mainstream and tributary dams
Predation by non-native fish	Predation by non-native fish	Determine the effect of non-native fish on sicklefin chub
Removal of wild individuals used for bait fish	Removal of wild individuals used for bait fish	Educate the public on the identification and importance of native species

Additional Citations

American Fisheries Society, Montana Chapter Website. 2013. http://www.fisheriessociety.org/AFSmontana/SicklefinChub.html

Pflieger, W. L. 1975. The fishes of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.